

A revision of the genus *Gastrozona* Bezzi from China (Diptera: Tephritidae)

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Abstract: The genus *Gastrozona* Bezzi of China is revised. Eight species are recognized, among which one new species, *G. hancocki* sp. nov. is described; *G. soror* (Schiner) is newly reported from this country; *G. appendiculata* Zia, previously regarded as synonymous with *G. fasciventris* (Macquart), is here resurrected. A key to the species, and a diagnosis and illustrations for each species, are provided.

Key words: Diptera; Tephritidae; *Gastrozona* Bezzi; new species; new record; China

The definition of the genus *Gastrozona* Bezzi has previously been confused in the literature. A total of 17 species have been reported, but only 10 (including *G. appendiculata* Zia) are presently included in this genus, some of which have been treated as synonyms and some placed in different genera (Hardy, 1973; Hancock and Drew, 1999). Most species of the genus apparently occur in the Oriental region with only one species in the Palaearctic region. The larvae are known to breed in bamboo shoots and adults are attracted to cut bamboo in the field (Shiraki, 1933; Hardy, 1973, 1988; Wang, 1996; Hancock and Drew, 1999). *G. fasciventris* (Macquart) has been recorded as a potential pest of bamboo shoots in Taiwan (Yen *et al.*, 1979).

In this study we treat all of the known Chinese species of *Gastrozona* Bezzi, taxonomic revision being based on examinations of most type and non-type specimens from China and other Asian countries, together with data from recent field research and other new information on some species. Eight Chinese species are recognized, including one species described as new. The status of *G. appendiculata* Zia is discussed and a new distribution for one species is given. A key to the species, and a diagnosis and illustrations for each species, are provided.

Morphological terminology generally follows McAlpine (1981) and Foote *et al.* (1993). Body and wing

length were measured in millimeters. The abbreviations of material depositories used in this paper are as follows: BMNH, the Natural History Museum, London, UK; BPBM, Bernice P. Bishop Museum, Honolulu, Hawaii, USA; IZCAS, Institute of Zoology, Chinese Academy of Sciences, Beijing, China; USNM, National Museum of Natural History, Washington, D. C., USA.

Gastrozona Bezzi, 1913

Gastrozona Bezzi, 1913: 105. Type species: *Tephritis fasciventris* Macquart, by original designation.

Diagnosis: Head moderately to obviously higher than long, yellow to yellow-brown; with 3–4 pairs of frontal and 2 pairs of orbital bristles; ocellar bristles weak, hair-like or moderately developed; arista short to long plumose; the third antennal segment dorsoapically rounded. Scutum fulvous with dark markings or shining black with greyish to yellowish-tomentose vittae; postpronotal lobes yellow, postsutural lateral yellow vittae present or absent; scutellum yellow, usually with a black apical spot or medial dark vitta; thoracic chaetotaxy complement, 4 scutellars and 2 anepisternals (except *quadrivittata* Wang), dorsocentral bristles approximately in line with postsutural supraalars. Wing with the apical extension of cell cup sinuous-shaped; wing pattern banded, yellow to dark brown; band across dm-cu crossvein always present; cost-

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al, subcostal and discal bands usually present; mid tibia with a apical spine. Abdomen fulvous, usually with black bands; male with anal papillae and female with 2 oblong spermathecae and an elongate, setose aculeus.

Remarks: This genus is very similar to *Paragastrozona* Shiraki in the body colouration, head and thoracic chaetotaxy, particularly in the wing venation and pattern, but genital characters of these two genera are very different: in *Paragastrozona* Shiraki, the male lacks anal papillae, and the female has a broad, non-setose aculeus (Wang, 1996: Figs. 139, 140, 203 – 205; Hancock and Drew, 1999: Figs. 62, 67).

Some species previously regarded as members of the Chinese *Gastrozona* fauna have been excluded. *G. vulgaris* Zia described from southern China and *G. fukienica* Hering from Fujian Province have been transferred to *Paragastrozona* Shiraki; *G. menglanica* Wang described from Yunnan Province was considered to be a female and a synonym of *G. parviseta* Hardy (Hancock and Drew, 1999). In addition, *G. appendiculata* Zia from Gansu Province, formerly considered a synonym of *G. fasciventris* (Macquart) by Hardy (1973), is here resurrected.

Key to species of *Gastrozona* from China

1. Scutellum yellow with a medial brown to black vitta or an apical black spot 1
Scutellum entirely yellow 6
2. Scutum with a pair of distinct prescutellar yellow vittae reaching dorsocentral bristles anteriorly and united with postsutural lateral yellow vittae posteriorly 3
Scutum without a pair of distinct prescutellar yellow vittae 4
3. Subapical band across vein M united with costal band at vein R_{4+5} , free from band across dm-cu crossvein (Fig. 4); scutellum yellow with a medial brown to black vitta *fasciventris* (Macquart)
Subapical band across vein M free from costal band, ending before vein R_{4+5} and directed towards or weakly connected to band across dm-cu crossvein (Fig. 5); scutellum yellow with a medial brown to black vitta *sorsor* (Schiner)
4. Wing with cell c largely hyaline; costal band united with basal dark area along vein R_{4+5} or at apex of cell br, with a broad, triangular hyaline indentation at end of cell sc; subapical band jointed to costal band 5
Wing with cell c entirely yellow-brown; costal band long and broad, extending from base of cell bc to the apex of cell R_{4+5} ;

subapical band united with discal band across r-m crossvein that extends basally to apex of vein $A_1 + CuA_2$, free from costal band (Fig. 18); scutum fulvous with 2 posterolateral black spots, scutellum yellow with a small apical black spot in both sexes (Fig. 19) *hancocki* sp. nov.

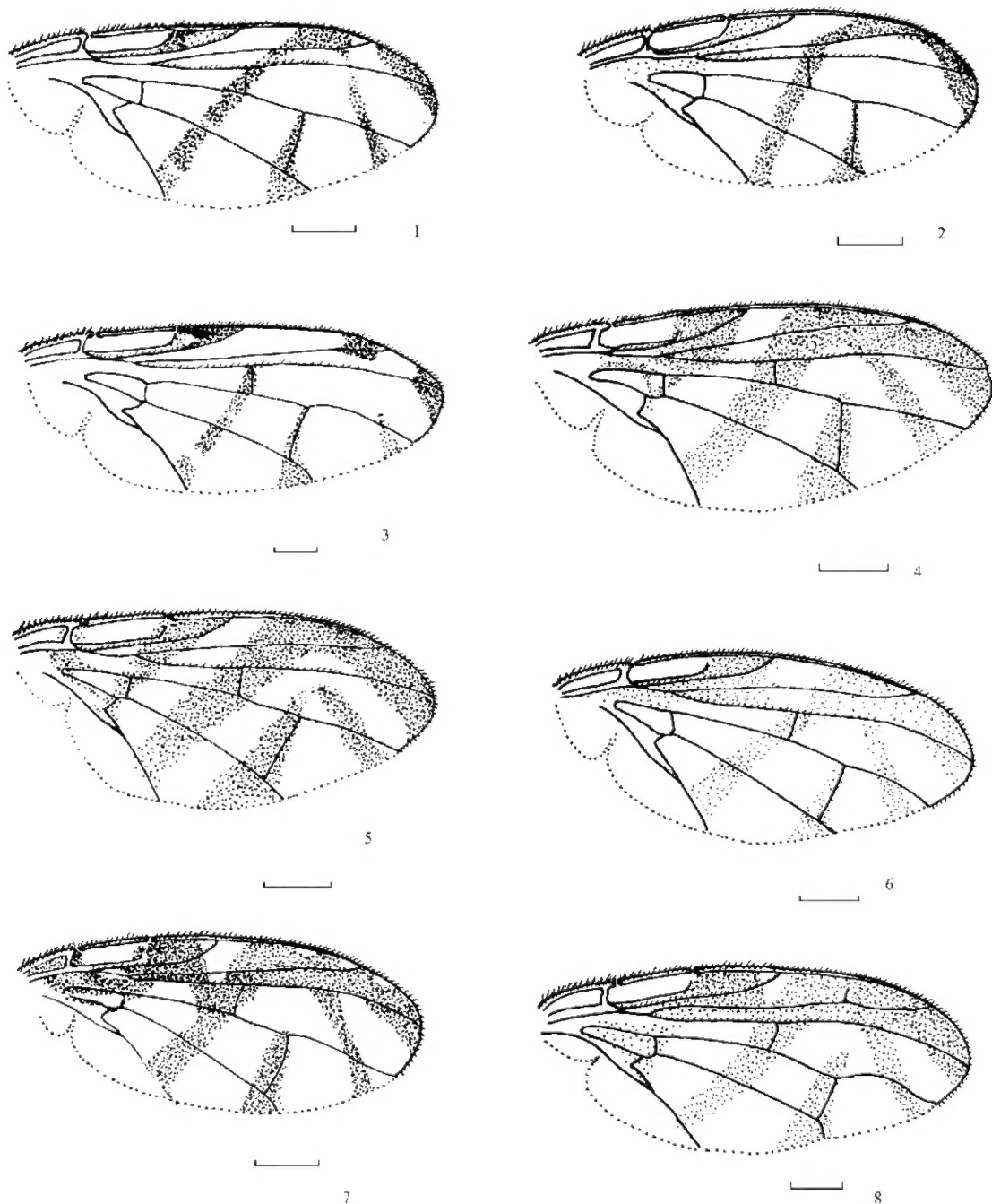
5. Scutum black with 2 yellowish-tomentose submedial vittae and postsutural lateral yellow vittae; scutellum with a large apical black spot in both sexes; wing with cell bc entirely brown, vein R_{2+3} not undulated, lacking a short spurious vein (Fig. 7); legs with apices of hind femora black ... *quadrivittata* Wang
Scutum fulvous with 2 greyish-tomentose submedial vittae, 2 posterolateral black spots, dorsocentral black vittae and postsutural lateral yellow vittae; scutellum with an apical black spot in male (female unknown); wing with cell bc entirely hyaline, vein R_{2+3} undulated, subapically with a short anteriorly directed spurious vein; (Fig. 8); legs entirely yellow *appendiculata* Zia
6. Scutum fulvous with a black posterior margin and a broad prescutellar yellow area 7
Scutum fulvous with 2 submedial black vittae and 2 posterolateral black spots, lacking a broad prescutellar yellow area; wing with costal band free from basal dark area, cells bc and c hyaline, cell sc entirely brown-yellow, subapical band united with costal band (Fig. 6); abdomen yellow-brown with a medially interrupted black band on posterior margin of tergum III *hirtiventris* Chen
7. Scutum with 2 dorsolateral black vittae; wing with discal band across r-m crossvein reaching costa; costal band complement and subapical band absent in male (Fig. 2) or costal band interrupted at apex of vein R_{2+3} and subapical band present in female (Fig. 1); ovipositor as long as terga III-VI combined *parviseta* Hardy
Scutum without dorsolateral black vittae; wing with discal band across r-m crossvein not reaching costa, costal band reduced to isolated spots, subapical band present and short in both sexes (Fig. 3); ovipositor equal in length to remainder of abdomen *balioptera* Hardy

Gastrozona appendiculata Zia, 1938 stat. rev. (Fig. 8)

Gastrozona appendiculata Zia, 1938: 22 (SE Gansu, China); Hardy, 1973: 190.

Gastrozona fasciventris (Macquart): Hardy, 1973: 190. [misidentification]

Diagnosis: Head slightly higher than long; ocellar bristles moderately developed, as long as the upper orbitals; arista short plumose; scutum shining orange-yellow in

Figs. 1~8 Wings of *Gastrozona* spp.

1. *G. parviseta* (♀); 2. *G. parviseta* (♂); 3. *G. balioptera*; 4. *G. fasciventris*; 5. *G. soror*
 6. *G. hirtiventris*; 7. *G. quadrivittata*; 8. *G. appendiculata*. Scale bar = 1 mm

ground colour, with 2 grayish-tomentose submedial vittae, 2 black posterolateral spots and a pair of black dorsocentral vittae which are interrupted at suture; postsutural yellow vittae rather narrow and indistinct; scutellum yellow with an apical black spot; postnotum entirely black; wing pattern banded, with cells bc and c entirely hyaline; cell sc mostly yellow-brown, about as long as cell c; costal

band united with basal dark area along with vein R_{4+5} ; subapical band joined to costal band, free from band across dm-cu crossvein; with a broad, triangular hyaline indentation at end of cell sc; vein R_{2+3} obviously undulated, subapically with a short spurious vein (Fig. 8); abdomen red-brown, with black bands on terga III and IV in male. The female is unknown.

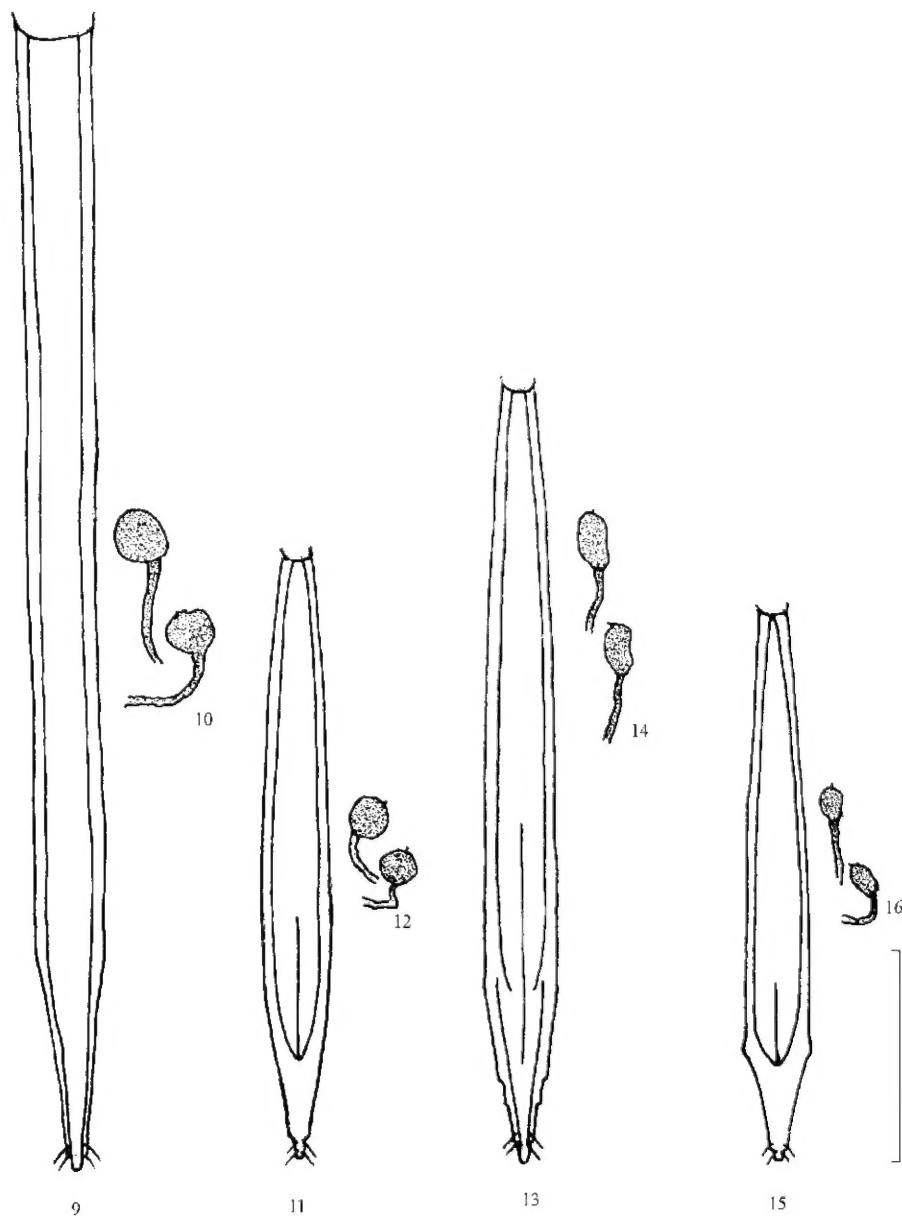
Material examined: Holotype ♂, China: Southeastern Gansu, 6. V. 1919.

Biology: Unknown.

Distribution: China (Gansu).

Remarks: The male terminalia have not been exam-

ined. The above specific diagnosis is based on the original description plus examination of the holotype. This species was previously regarded as a synonym of *G. fasciventris*, but differs from the latter in head shape, thoracic and abdominal markings, wing venation and pattern details.



Figs. 9 ~ 16 Aculeus and spermathecae of *Gastrozona* spp.

9 - 10. *G. balioptera*; 11 - 12. *G. parviseta*; 13 - 14. *G. hancocki* sp. nov.; 15 - 16. *G. soror*. Scale bar = 0.5 mm

***Gastrozona balioptera* Hardy, 1973 (Figs. 3, 9, 10)**

Gastrozona balioptera Hardy, 1973: 188 (Thailand); Wang, 1996: 36; Hancock and Drew, 1999: 722.

Diagnosis: This species is related to *G. parviseta* and *G. montana* Bezzi from India and Burma because the

head is moderately higher than long; ocellar bristles vestigial, hair-like; scutum fulvous with a black posterior margin, a broad prescutellar yellow area and 2 postsutural lateral yellow vittae; scutellum entirely yellow; but is readily differentiated by the wing markings greatly reduced

to isolated spots in both sexes (Fig. 3); oviscap is longer, equal in length to the remainder of abdomen.

Material examined: Holotype ♂ and allotype ♀, Thailand: Chiangdao, Chiang Mai, 6. IV. 1958, Phon (BMNH). Paratypes: 2 ♀, Burma: Mt. Victoria, Chin Hills, 1 400 m, III-IV. 1938, G. Heinrich (BMNH). 1 ♀, China: Yunnan, Xishuangbanna, 700 m, 16. IV. 1957, F. J. Pu; 2 ♀, Yunnan, Menghai, 1 200 m, 29. IV. 1957, L. C. Zhan (IZCAS).

Biology: Unknown.

Distribution: China (Yunnan), Thailand, India, Burma.

Remarks: The male terminalia has 8 elongate anal papillae (Hardy, 1973: 189, Fig. 87e). Genital characters of the female examined have 2 oblong spermathecae (Fig. 10); aculeus very elongate, and with preapical spines and setae (Fig. 9)

Gastrozona fasciventris (Macquart, 1843) (Fig. 4)

Tephritis fasciventris Macquart, 1843: 382 (India).

Tephritis vittata Macquart, 1851: 263 (Asia). Synonymized by Hardy, 1973: 190.

Gastrozona macquarti Hendel, 1913: 38. (Taiwan). Synonymized by Hardy, 1973: 190.

Gastrozona melanista Bezzi, 1913: 107 (India). Synonymized by Hardy, 1973: 190.

Gastrozona melanophila Hering, 1940: 3 (Taiwan). Synonymized by Hardy, 1973: 190.

Diagnosis: This species shows little sexual dimorphism in body markings and is closely related to *G. soror* in most of the characteristics, differing primarily by having the subapical band united with the costal band; male terminalia with 6 rather long anal papillae (Hardy, 1988: 100, Fig. 21a). It appears to be related to *G. appendiculata* Zia, but can be distinguished by the head much higher than long; arista long plumose; scutum with a pair of prescutellar yellow vittae and scutellum with a medial brown to black vitta; costal band free from basal dark area; cell *sc* much shorter than cell *c* and vein R_{2+3} not undulated (Fig. 4).

Material examined: 1 ♂, China: Guangxi, Jinxiu, 20. V. 1999, M. Y. Gao (IZCAS). Holotype ♂ of *G. melanophila* and 12 ♀, China: Taiwan, Tao Tsui Kutsu, V. 1914, H. Sauter; 1 ♂, 1 ♀, Polisha, III. 1908, H. Sauter (BMNH). 3 ♀, Thailand: Kan-

chanaburi, 31. V. 1962, Phun (BMNH). 3 ♀, Burma: Rangoon, 23. XI. 1904-1. I. 1905 (BMNH). 4 ♀, India: Parambikulam, 1 700 - 3 200 m, Cochin State, 16 - 24. IX. 1914, F. H. Gravely; 2 ♂, Ranikhet, Utta Pradesh, 20. IV. and 17. V. 1949, I. M. Newell (BMNH). 2 ♂, 4 ♀, Malaysia: Hulu, Langat, Selangor, IV - VII. 1988, C. S. Ooi (BMNH). 1 ♂, Indonesia: Sungei Penok, Korinchi Valley, Sumatra, 2 600 m, III. 1914 (BMNH).

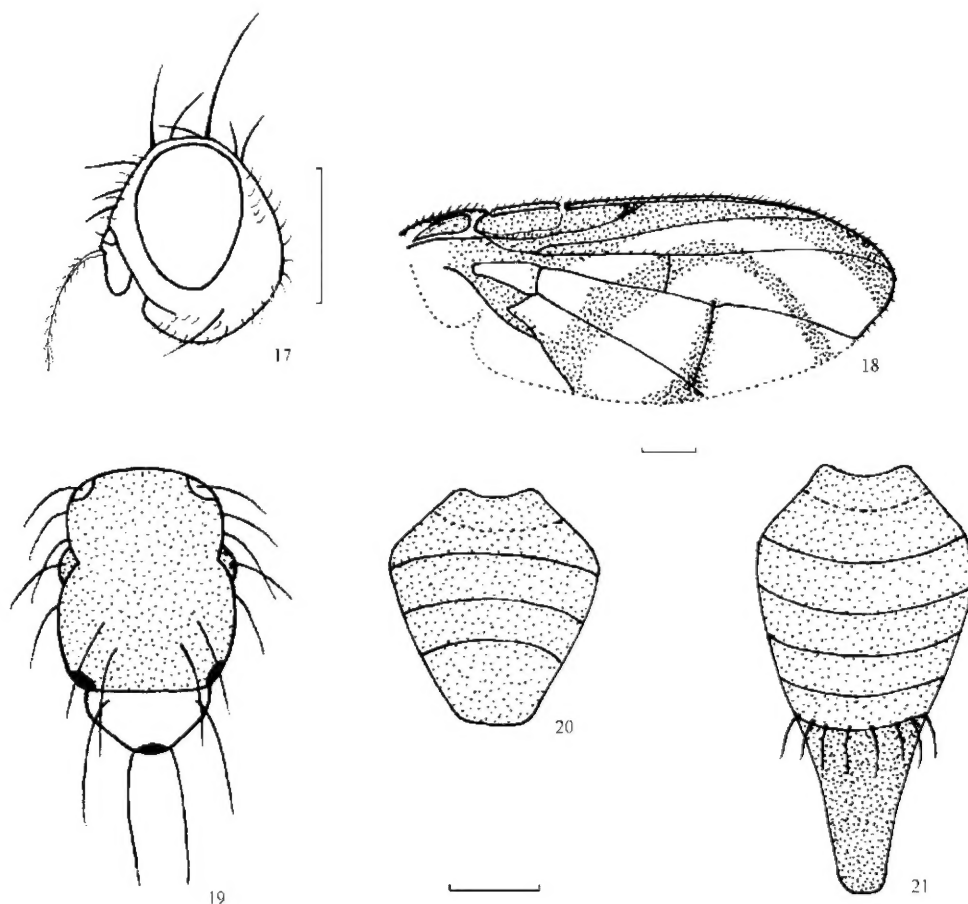
Biology: A potential pest of bamboo shoots in Taiwan of China, this species has been recorded from shoots of *Bambusa dolichoclata*, *B. glaucescens*, *B. oldhami*, *B. shimadai*, *B. stemostachya*, *B. tulda*, *B. tuldoidea*, *Dendrocalamus asper*, *D. giganteus*, *D. hamiltonii*, *D. latifrons*, *Gigantochloa auriculata*, *G. nigrociliata*, *Phyllostachys mackinoi*, *P. nigripes*, *P. pubescens* and *Thyrostachys siamensis* (Shiraki, 1933; Yen *et al.*, 1979).

Distribution: China (Guangxi, Taiwan), Vietnam, Laos, Thailand, India, Bangladesh, Burma, Malaysia, Indonesia (Sumatra).

Remarks: This species was previously recorded from Taiwan and is now newly reported from the continent of China. The thoracic markings of the Chinese male specimen are similar to those of females except for the abdomen which has a black transverse band across tergum III and a medially interrupted band on tergum V. The aculeus elongate, slightly trilobed apically and with preapical spines and setae (Hardy, 1973, 1988).

Gastrozona hancocki sp. nov. (Figs. 13 - 14, 17 - 21)

Male: Length of body 6.5 mm, of wing 7.5 mm. Head yellow, slightly higher than long, protruding slightly at antennal bases. Frons parallel sided, as wide as eye. Face concave, slightly projecting at lower margin. All bristles black; 3 pairs of frontal and 2 pairs of orbitals; ocellars vestigial, shorter than upper orbitals; genal, vertical, postvertical and postocellars well developed. Occiput slightly swollen, with a row of postocular bristles. Antennae orange-yellow, shorter than face; third segment dorsoapically rounded; arista moderately plumose (Fig. 17).

Figs. 17~21 *Gastrozona hancocki* sp. nov.

17. head, lateral view; 18. wing; 19. thorax, dorsal view; 20. male abdomen, dorsal view; 21. female abdomen, dorsal view. Scale bar = 1 mm

Thorax with a complement of black thoracic bristles: 2 anepisternals and 4 scutellars; dorsocentrals approximately in line with postsutural supraalars. Scutum shining yellow-brown in ground colour, with a pair of round black posterolateral spots; 2 indistinctive, narrow postsutural yellow vittae and a broad prescutellar yellow area. Pleura mostly yellow-brown, with a narrow yellow band along upper margin from postpronotal lobe to wing base; subscutellum and postnotum entirely yellow. Scutellum yellow, with a black apical spot (Fig. 19).

Legs entirely yellow; fore femur with a row of posteroventral black bristles; mid tibia with a black apical spine.

Wing pattern banded, yellow-brown to brown; costal band broad and long, extending from base of cell bc to apex of cell R_{4+5} ; cell sc a little shorter than cell c , yellow-brown with extreme apex dark brown; subapical band united with discal band across $r-m$ crossvein that extends

basally to apex of vein $A_1 + CuA_2$, free from both costal band and band across $dm-cu$ crossvein (Fig. 18).

Abdomen entirely yellow-brown (Fig. 20); male terminalia have not been examined.

Female: Length of body 8.5 – 9.0 mm (excluding oviscap), of wing 9.0 – 9.5 mm. Similar to characteristics of male except that scutum lacks postsutural yellow vittae and prescutellar yellow area (Fig. 19); abdominal terga entirely yellow-brown; oviscap red-brown, about as long as terga IV–VI combined (Fig. 21); with 2 oblong spermathecae (Fig. 14); aculeus elongate, with preapical steps and setae (Fig. 13).

Etymology: This species is named after Dr. D. L. Hancock, in recognition of his outstanding contributions to the study of African, Australian and Asian Tephritidae.

Types: Holotype ♀, China: Guizhou, Chishui, 21 – 23. IX. 2000, X. L. Chen. Paratypes: 1 ♂ and 5

♀, same as holotype. All of the type specimens are deposited in IZCAS.

Biology: Unknown.

Distribution: China (Guizhou).

Remarks: This species differs from other members of *Gastrozona* by having two posterolateral black spots on scutum and one apical black spot on the scutellum; wing with subapical band united with discal band across r-m crossvein that extends basally to apex of vein $A_1 + CuA_2$, free from both costal band and band across dm-cu crossvein.

Gastrozona hirtiventris Chen, 1948 (Fig. 6)

Gastrozona hirtiventris Chen, 1948: 97 (Zhejiang, China).

Hardy, 1973: 188; Wang, 1996: 37; Hancoch and Drew, 1999: 726.

Diagnosis: Head much higher than long; ocellar bristles well developed, longer than the upper orbitals; arista short plumose; scutum fulvous with 2 black dorso-central vittae and 2 black posterolateral spots, but postsutural yellow vittae and prescutellar yellow area absent; scutellum entirely yellow; wing pattern banded, pale yellow to yellow; cells bc and c entirely hyaline; cell sc yellow-brown; costal band free from basal dark area; subapical band united with costal band; band across dm-cu crossvein isolated (Fig. 6); abdomen with a medially interrupted black band on tergum III in the male. The female is unknown.

Material examined: Holotype ♂, China: Zhejiang, Moganshan, 11. V. 1935 (IZCAS).

Biology: Unknown.

Distribution: China (Zhejiang).

Remarks: This species is known only from the holotype, male terminalia have not been examined. It appears to be related to *G. fasciventris* in wing pattern, but differs from the latter by the short arista plumose, scutum without postsutural and prescutellar yellow vittae; entirely yellow scutellum without medial brown to black vittae.

Gastrozona parviseta Hardy, 1973 (Figs. 1, 2, 11–12)

Gastrozona parviseta Hardy, 1973: 192 (Thailand); Wang, 1996: 38; Hancock and Drew, 1999: 729.

Gastrozona menglanica Wang, 1996: 37 (China). Synonymized by Hancock and Drew, 1999: 744.

Diagnosis: This species exhibits remarkable sexual dimorphism in the wing markings: in males the costal band extends continuously to the apex of cell R_{4+5} , subapical band absent (Fig. 2); whilst in females the costal band is interrupted at the apex of vein R_{2+3} , subapical band present, usually connected to costal band (Fig. 1). It appears to be related to *G. balioptera* and *G. montana*, differing primarily in having a pair of black dorso-central vittae and the wing pattern details.

Material examined: Holotype ♂ (Bishop 9974), Thailand: Chiangmai Prov., Chiangdai, 450 m, 5–11. IV. 1958, T. C. Maa (BPBM). Holotype ♀ and paratype 1 ♀ of *G. menglanica*, China: Yunnan, Mengla, 800 m, 10–11. IV. 1981, C. K. Yang; 1 ♂, Yunnan, Cheli, 620 m, 22. V. 1957, L. C. Zang; 1 ♂, Yunnan, Xishuangbanna, 2. IX. 1957, S. Y. Wang; 1 ♂, same locality as above, 810 m, 30. III. 1957, L. C. Zang; 3 ♂, as above, Genma, 29. IX. 1953 (IZCAS). 2 ♂, 2 ♀, Burma: Mt. Victoria, Chin Hills, 500–1000 m, III. 1938, G. Heinrich (BMNH). 1 ♂, India: Mudigere, Kamataka, 980 m, UASB Research Station, 20–22. V. 1992, I. M. White, D. L. Hancock and S. Ramani (BMNH).

Biology: Unknown.

Distribution: China (Yunnan), Thailand, India, Burma.

Remarks: The male terminalia were illustrated by Wang (Wang, 1996: Fig. 136) and genital characters of the female examined include 2 oblong spermathecae (Fig. 12), aculeus elongate and with preapical steps and setae (Fig. 11).

Gastrozona quadrivittata Wang, 1992 (Fig. 7)

Gastrozona quadrivittata Wang, 1992: 1150. (Guizhou and Hunan, China); Wang, 1996: 38.

Diagnosis: Head much higher than long; ocellar bristles moderately developed, a little shorter than upper orbitals; arista short plumose; scutum black with 2 orange-yellow tomentose submedial vittae and postsutural yellow vittae; pleura mostly black, with a broad yellow band across anepisternum connected to postpronotal lobe, anatergite and katatergite yellow; only 1 anepisternal bristle present; scutellum yellow with a large black apical spot in both sexes; wing pattern banded; with cell bc en-

tirely brown, cell c largely hyaline except brown at base; cell sc dark brown except hyaline at extreme apex; costal band united with basal dark area at apex of cell br; subapical band jointed to costal band; band across dm-cu crossvein free from other bands; with a broad, triangular hyaline indentation at end of cell sc (Fig. 7); legs yellow with black apices of hind femora; abdomen yellow to orange-yellow, with medially interrupted black bands on terga III-V and a black band on posterior margin of tergum V in male; or terga III and VI black, with medially interrupted black bands on terga IV and V in female; oviscapae black, as long as terga IV-VI combined.

Material examined: Holotype ♀, China: Guizhou, Mt. Leigong, 1 700 – 2 100 m, 2. VII. 1988, L. L. Yang; paratype: 1 ♂, Hunan, Daoxian, 1 700 m, 27. VII. 1988 (IZCAS).

Biology: Unknown.

Distribution: China (Guizhou, Hunan).

Remarks: Genital characters of both sexes have not been studied. This species appears to be related to *G. proterva* Hering from northern Burma, differing from the latter in the cell bc being entirely brown, the costal band being united with basal dark area in both sexes (Fig. 7), the thorax with only one anepisternal bristle and a more extensive apical black spot on the scutellum.

Gastrozona soror (Schiner, 1868) (Figs. 5, 15–16)

Acidia soror Schiner, 1868: 264 (Java).

Gastrozona soror (Schiner): Bezzi, 1926: 258, 262; Hardy, 1968: 141, 1973: 193, 1988: 99; Hancock and Drew, 1999: 732.

Diagnosis: This species resembles *G. fasciventris* in head shape and body markings, differing primarily by having the subapical band directed towards or connected to the band across the dm-cu crossvein, free from the costal band (Fig. 5); male terminalia with 2 long and 2 short anal papillae (Hardy, 1988: 100, Fig. 22a).

Material examined: 1 ♀, China: Yunnan, Ruili, 20. VIII. 2001, S. Xiao (IZCAS). 1 ♀, Thailand: Bangkok, 1885; 2 ♂, 1 ♀, Thailand: Biserat, 16. VII. 1901, H. C. Robinson and N. Annandale (BMNH).

Biology: Bred from shoots of *Bambusa* sp. and *Dendrocalamus asper* in Thailand (Hancock & Drew,

1999).

Distribution: China (new record from Yunnan), Thailand, India, Indonesia (Java).

Remarks: The female terminalia examined have 2 oblong spermathecae (Fig. 16); aculeus elongate, slightly trilobed apically and with preapical steps and setae (Fig. 15).

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- 180.

中国羽角实蝇属分类研究

(双翅目: 实蝇科)

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摘要: 对中国实蝇科的羽角实蝇属 *Gastrozona* Bezzi 进行了全面概述和厘订, 本属在我国现知共有 8 种, 其中包括一个新种: 汉氏羽角实蝇 *G. hancochi* sp. nov.; 一个中国新记录种: 微连羽角实蝇 *G. soror* (Schiner)。附脉羽角实蝇 *G. appendiculata* Zia 以前曾被误作是笋黄羽角实蝇 *G. fasciventris* (Macquart) 的同物异名, 现提出恢复其种的地位。除描述新种外, 还提供中国羽角实蝇属已知种类的鉴别特征、分种检索表及其特征图。

关键词: 双翅目; 实蝇科; 羽角实蝇属; 新种; 新记录; 中国

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